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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10 002,696	10 31 2001	Eliyahu Harari	11587 M-12336 US	4652

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EXAMINER

WEISS, HOWARD

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 01 22 2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/002 696

Applicant(s)

HARARI ET AL

Examiner

Howard Weiss

Art Unit

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-- The MAILING DATE of this communication

appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR THE MAILING DATE OF THIS COMMUNICATION

IS SET TO EXPIRE 3 MONTH(S) FROM

- Extensions of time may be available under the provisions of 37 C.F.R. 1.136(a) after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, the period for reply is specified above.
- If NO period for reply is specified above, the maximum statutory period for reply within the set or extended period for reply is three months.
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 C.F.R. 1.104(b).

36(a). In no event, however, may a reply be timely filed

within the statutory minimum of thirty (30) days will be considered timely and will apply and will expire SIX (6) MONTHS from the mailing date of this communication because the application to become ABANDONED (35 U.S.C. § 133). The date of this communication, even if timely filed, may reduce any

Status

- ☐ Responsive to communication(s) filed on
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for prosecution, the action is non-final.

November 2002

is action is non-final.

abeyance except for formal matters, prosecution as to the merits is *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- ☐ Claim(s) 13, 15-23 and 25-36 is/are:
 - Of the above claim(s) 13, 15-23 and 25-36 is/are:
 - Claim(s) 13, 15-23 and 25-36 is/are allowed.
 - Claim(s) 13, 15-23 and 25-36 is/are rejected.
 - Claim(s) 13, 15-23 and 25-36 is/are objected to.
 - Claim(s) 13, 15-23 and 25-36 are subject to restriction.

the application

own from consideration.

election requirement.

Application Papers

- ☐ The specification is objected to by the Examiner.
- ☐ The drawing(s) filed on 11/1/02 is/are:
 - Applicant may not request that any objection be held in abeyance.
- ☐ The proposed drawing correction filed on 11/1/02 is/are:
 - If approved, corrected drawings are required.
- ☐ The oath or declaration is objected to by the Examiner.

of

ected or b) ☐ objected to by the Examiner.

the drawing(s) be held in abeyance. See 37 C.F.R. 1.85(a).

is a) ☐ approved b) ☐ disapproved by the Examiner.

ply to this Office action.

aminer.

Priority under 35 U.S.C. §§ 119 and 120

- ☐ Acknowledgment is made of a claim for:
 - All
 - Some *
 - None of
 - Certified copies of the priority documents have been received.
 - Certified copies of the priority documents have been received in Application No. 10/002 696.
 - Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action.
- ☐ Acknowledgment is made of a claim for:
 - The translation of the foreign language of the priority document has been received.
- ☐ Acknowledgment is made of a claim for:
 - provisional application has been received.
 - provisional application has been received.

priority under 35 U.S.C. § 119(a)-(d) or (f).

is have been received.

is have been received in Application No. 10/002 696.

ity documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

of the certified copies not received.

ic priority under 35 U.S.C. § 119(e) (to a provisional application).

ovisional application has been received.

ic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-893)
- ☒ Information Disclosure Statement (PTO-1449, Rev. 11/01)

- ☐ Interview Summary (PTO-413) Paper No(s) 10/002 696
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: 9 & 12

ation Summary

Part of Paper No. 13

Attorney's Docket Number: M-12336 US

Filing Date: 10/31/01

Continuing Data: none

Claimed Foreign Priority Date: none

Applicant(s): Harari et al. (Samachisa Yuan, Guterman)

Examiner: Howard Weiss

Claim Objections

1. Claim 28 is objected to under 37 CFR 1.75(c) as being in improper form because dependent claim cannot be dependent upon a multiple dependent claim. See MPEP § 608.01(n). Accordingly, the claim has not been further treated on the merits.
2. IN Claims 13 and 23, "injection or source-side" should be changed to ---injection and source-side---. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 26 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. Claim 26 recites the limitation "at least first and second gate elements" in Lines 1 and 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 13, 15, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eitan (U.S. Patent No. 6,011,125) and Reisinger (U.S. Patent No. 6,137,718).

Eitan shows most aspects of the instant invention (e.g. Figures 2 to 12) including:

- programming means (Column 12 Line 60 to Column 13 Line 33) supplying voltages to the gates **24**, source **14** and drain **16** regions to one of two threshold levels in one of two defined portions **23** of a charge storage dielectric **18** containing silicon nitride
- reading means for reading the programmed values as claimed (Column 13 Line 35 to Column 17 Line 30)

Eitan does not show the storage of more than two defined ranges. Reisinger teaches (e.g. Figure 1) to store four (Column 7 Lines 25 to 30) or more (Column 6 Lines 5 to 35) ranges in a charge storage dielectric **52** in order to increase the storage density (Column 2 Lines 7 to 12). It would have been obvious to a person of ordinary skill in the art at the time of invention to store four or more ranges in a charge storage

dielectric as taught by Reisinger in the device of Eitan in order to increase the storage density

In reference to the claim language referring to how the cells are programmed (either by channel hot-electron or source-side injection), intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. *In re Casey*, 152 USPQ 235 (CCPA 1963); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). In the instant case, the structure of the memory cells in Eitan and Reisinger show the same structure (i.e. a three layered dielectric storage layer) and, therefore, are capable of being used as claimed.

8. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eitan and Reisinger, as applied to Claim 13 above, and further in view of DiMaria (Journal de Physique 1981)

Eitan and Reisinger show most aspects of the instant invention (Paragraph 7) except for the charge storage dielectric including silicon rich silicon dioxide. DiMaria teaches (e.g. Figure 3) to use a charge storage dielectric including silicon rich silicon dioxide to produce a memory device with excellent breakdown characteristics (Page C4-1117 second paragraph). It would have been obvious to a person of ordinary skill in the art at the time of invention to use a charge storage dielectric including silicon rich silicon dioxide as taught by DiMaria in the device of Eitan and Reisinger to produce a memory device with excellent breakdown characteristics.

9. Claims 19, 21 to 26, 29 to 31 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al. (U.S. Patent No. 5,278,439) and Reisinger.

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- Ma et al. show most aspects of the instant invention (e.g. Figures 2 and 3) including:
- an array of memory cells **20**, **22** with elongated source and drain regions **20A**, **22A** within a substrate **26** and extending in a first direction and separated in a second direction perpendicular to said first direction
 - a channel region **22** extending between said source/drain regions
 - first and second conductive (control) gates **20C**, **22C** extending in said first direction and first and second storage elements **20B**, **22B**
 - conductive word lines **28** extending in said second direction
 - a third control transistor gate **24A** positioned between said storage elements and coupled by a gate dielectric to the channel **24G**

Ma et al. shows do not show the storage of more than two defined ranges using charge storage dielectric. Reisinger teaches (e.g. Figure 1) to store four (Column 7 Lines 25 to 30) or more (Column 6 Lines 5 to 35) ranges in a charge storage dielectric **52** in order to increase the storage density (Column 2 Lines 7 to 12). It would have been obvious to a person of ordinary skill in the art at the time of invention to store four or more ranges in a charge storage dielectric as taught by Reisinger in the device of Ma et al. in order to increase the storage density.

In reference to the claim language referring to how the cells are programmed (either by channel hot-electron or source side injection) and read, intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

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10. Claims 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al. and Reisinger, as applied to Claim 19 above, and further in view of Eckert et al. (U.S. Patent No. 5,889,303).

Ma et al. and Reisinger show most aspects of the instant invention (Paragraph 9) except for the charge trapping material extending continuously between two control gates. Eckert et al. teach (e.g. Figures 10 and 11) to have charge storage material **106** extend between two control gates **110a,b** to reduce gate oxide stress (Column 2 Lines 37 to 60). It would have been obvious to a person of ordinary skill in the art at the time of invention to have charge storage material extend between two control gates as taught by Eckert et al. in the device of Ma et al. and Reisinger to reduce gate oxide stress.

11. Claims 27, 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al. and Reisinger, as applied to Claim 19 above, and further in view of Aritome et al. (IEDM 95).

Ma et al. and Reisinger show most aspects of the instant invention (Paragraph 9) except for the word lines recessed into the substrate. Aritome et al. teach (e.g. Figure 1) to recess word lines into the substrate to realize a very low bit cost (see Abstract). It would have been obvious to a person of ordinary skill in the art at the time of invention to recess word lines into the substrate as taught by Aritome et al. in the device of Ma et al. and Reisinger to realize a very low bit cost.

12. Claims 34 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al. (U.S. Patent No. 6,346,715 and hereinafter Ma '725) and Reisinger.

Ma '725 show most aspects of the instant invention (e.g. Figures 3) including:

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- an array of memory cells **S1** to **S6** with elongated source **120** and drain **30** regions within a substrate **40** extending in a first direction and separated in a second direction perpendicular to said first direction
- a channel region **80** extending between said source/drain regions
- conductive control lines **70** extending in said first direction and adjacent one of said source/drain regions in a first portion of space between said regions
- conductive word lines **710** spaced apart in said first direction, extending in said second direction over said control lines and positioned over a second portion of space neighboring source/drain regions
- charge storage material **60** positioned between said word and control lines

Ma 725 shows do not show the storage of more than two defined ranges using dielectric charge storage material and the explicit programming and reading circuits. Reisinger teaches (e.g. Figure 1) to store four (Column 7 Lines 25 to 30) or more (Column 6 Lines 5 to 35) ranges in dielectric charge storage material **52** using programming and reading means as claimed in order to increase the storage density (Column 2 Lines 7 to 12). It would have been obvious to a person of ordinary skill in the art at the time of invention to store four or more ranges in dielectric charge storage material using programming and reading means as claimed as taught by Reisinger in the device of Ma 725 in order to increase the storage density.

In reference to the claim language referring to how the cells are programmed (either by channel hot-electron or source-drain injection) and read, intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a material difference as compared to the prior art. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

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13. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ma '725 and Reisinger, as applied to Claim 35 above, and further in view of Eckert et al.

Ma '725 and Reisinger show many aspects of the instant invention (Paragraph 12) except for the charge trapping material extending continuously between two control gates. Eckert et al. teach (e.g. Figures 10 and 11) to have charge storage material **106** extend between two control gates **110a,b** to reduce gate oxide stress (Column 2 Lines 37 to 60). It would have been obvious to a person of ordinary skill in the art at the time of invention to have charge storage material extend between two control gates as taught by Eckert et al. in the device of Ma '725 and Reisinger to reduce gate oxide stress.

Response to Arguments

14. The Applicants' arguments filed 2/02 have been fully considered but they are not persuasive. In reference to the combination of references are programmed, functional or use limitation on the patentable weight in a device claim if the limitation translates to a significant structural difference in the resultant device and the instant invention. As stated in the rejection: "If the prior art structure is capable of performing the intended use, then it meets the claim." The stated combination of Prior Art meets this standard.

15. The Applicants' arguments with respect to claims 20, 27, 28 and 32 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

16. Applicant's amendment necessitates the new ground(s) of rejection presented in this Office action. Accordingly, **ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In the event, however, the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

17. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center located in Crystal Palace 4, room 3C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications. The official TC2814 Before-Final, **(703) 872-9318**, and After-Final, **(703) 872-9319** Fax numbers will provide the fax sender with an auto-reply fax verifying receipt of their fax by the SPTO.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(703) 308-4840** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via **Howard.Weiss@uspto.gov**.

Any inquiry of a general nature relating to the status of this application should be directed to the Group 2800 Receptionist at **(703) 308-0956**.

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19. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/366	thru 1/14/03
Other Documentation: none	
Electronic Database(s): EAST, IEL	thru 1/14/03

HW/hw
15 January 2003

Howard Weiss
Examiner
Art Unit 2814